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Poster paper

Ground deformation monitoring at Taiwan Light Source due to the construction of Taiwan Photon Source

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Taiwan Photon Source is now under construction at NSRRC Taiwan. In order to maintain the Taiwan Light Source (TLS) for normal operation, a hydrostatic levelling system and precision inclination sensor (Leica Nivel 220) were installed both in the storage ring and beamlines to monitor ground deformation arising. This paper presents the monitoring system setup and the circumstances of ground deformation including vertical settlement and floor inclination during the ground breaking period to provide a criterion for TLS operation.

1. Introduction

Due to the construction of Taiwan Photon Source (TPS), the ground motion at Taiwan Light Source (TLS) has to be monitored. Therefore, a ground deformation monitoring system was installed at TLS. This monitoring system comprises 12 measurement points, and each one consists of a hydrostatic levelling system (HLS) and a precision inclination sensor (Leica Nivel 220). The HLS and precision inclination sensor, respectively, measure the level of vertical settlement and floor inclination. The result data stored in computer are directly visible on screen, and delivered to the archive server for data management. The measurement data of HLS and precision inclination sensor are the mean value of 10 and 8 values taken in 10 s (Seryi *et al*. 2001).

2. Layout of monitoring system

Figure 1 shows the layout of monitoring system. Six measurement points are sited in storage ring, and the others are in beamline area. The measurement points in storage ring are placed in segment 1 (R1), segment 2 (R2), segment 3 (R3), segment 4 (R4), segment 5 (R5) and segment 6 (R6). Likewise, other measurement points are, respectively, located in HF-CGM High Flux beamline (03A), EPU-SGM beamline

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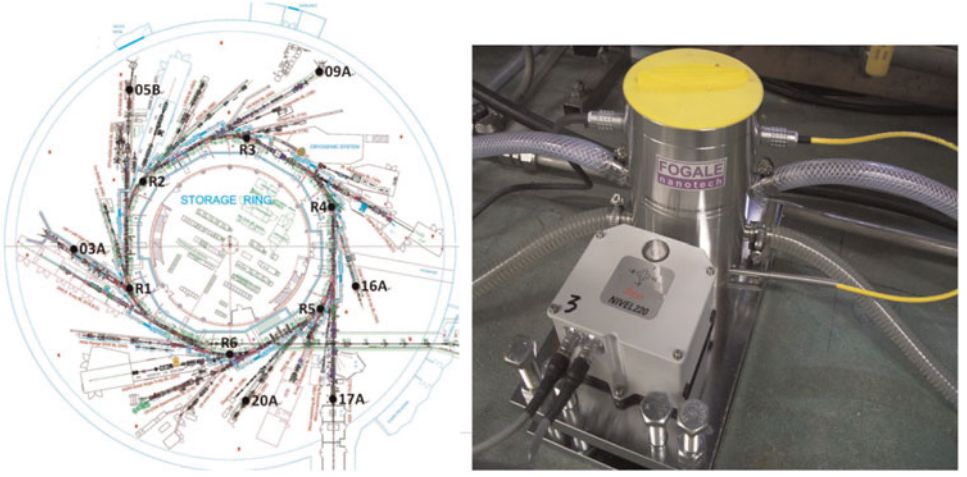

FIGURE 1. Layout of monitoring system and measurement point.

(05B), U5-SGM beamline (09), DCM Tender Soft X-ray beamline (16A), W20 X-ray beamline (17A) and HSGM beamline (20A).

3. Ground deformation monitoring

The measurement range of HLS and precision inclination sensor are 2.5 mm and ±3 mrad. For measuring data correctly, the HLS and precision inclination sensor are mounted on an adjustable plate adjusted within measurement range (Martin *et al.* 2002). For TLS operation, this study focuses on the relative ground deformation between every point instead of absolute ground deformation. All HLS-measured values are based on a comparison to measurement point R5, in which the floor is stable as figure 2(*a*) shows in *X*- and *Y*-direction.

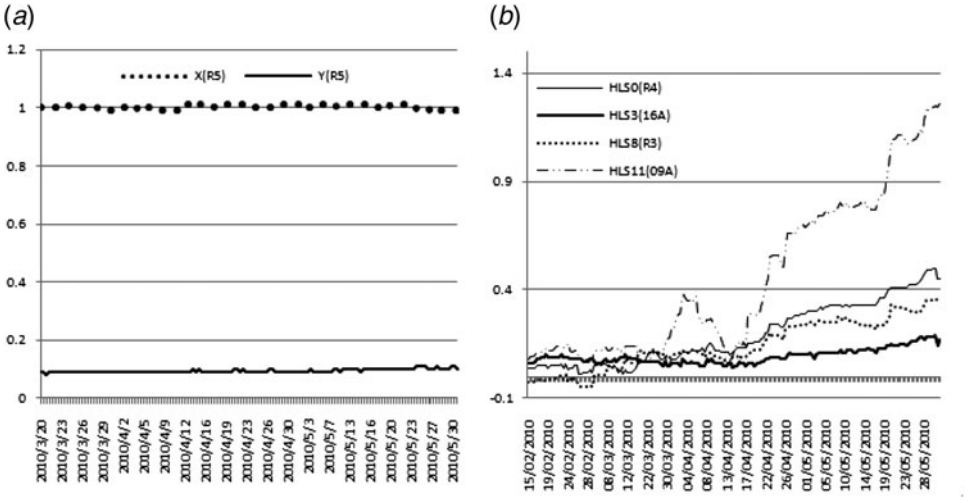

FIGURE 2. (*a*) Floor inclination at R5 and (*b*) ground vertical deformation at R3, R4, 09A and 16A.

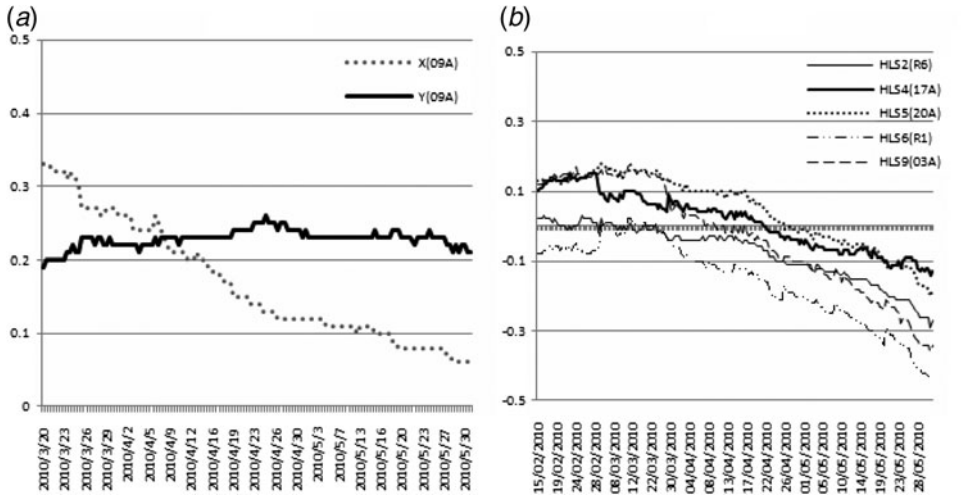

FIGURE 3. (*a*) Floor inclination at 09A and (*b*) ground vertical deformation at R1, R6, 03A, 17A and 20A.

Figures 2(*b*) and 3(*a*), respectively, demonstrate the circumstance of vertical ground deformation at TLS for the period 15 February 2010 to 31 May 2010. In particular, 09A, the nearest monitoring point to the area of TPS construction, rises about 1.2 mm, and the inclination of floor appears obviously. Figure 3(*a*) shows the condition of floor inclination at 09A. The floor vertical displacement and inclination at 09A are maximal among all measurement points. The neighbour measurement points of 09A also arise, such as R3, R4 and 16A, the quantity of ground deformation is about 0.35 mm for R3, 0.3 mm for R4 and 0.1 mm for 16A. On the contrary, the measurement points which are at a distance from area of TPS construction decline as figure 3(*b*) depicts. R1, R6, 03A, 17A and 20A, respectively, sink about 0.3, 0.3, 0.4, 0.2 and 0.25 mm. From these measurement data, it definitely demonstrates the floor deformation at TLS during TPS construction period.

4. Conclusion

This paper presents the condition of ground deformation at TLS. A monitoring system has been installed at TLS due to TPS construction. It is a system of real-time and automatic record measurement data to allow almost continuous monitoring. These measurement data can illustrate the situation of ground deformation and provide some references for TLS operation during the ground breaking period.

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